FIG. 1

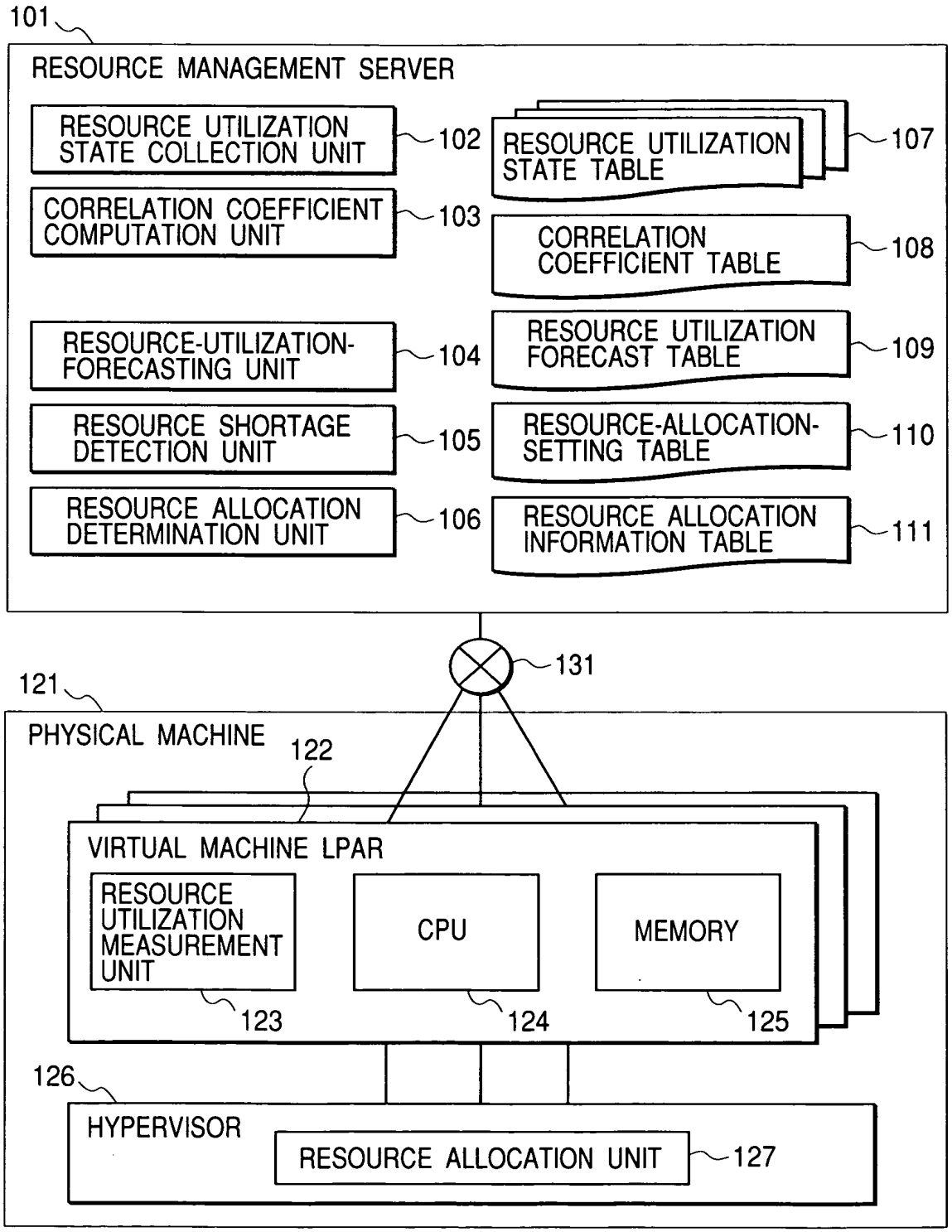

101
RESOURCE MANAGEMENT SERVER
RESOURCE UTILIZATION STATE COLLECTION UNIT
102
CORRELATION COEFFICIENT COMPUTATION UNIT
103
RESOURCE-UTILIZATION-FORECASTING UNIT
104
RESOURCE SHORTAGE DETECTION UNIT
105
RESOURCE ALLOCATION DETERMINATION UNIT
106
RESOURCE UTILIZATION STATE TABLE
107
CORRELATION COEFFICIENT TABLE
108
RESOURCE UTILIZATION FORECAST TABLE
109
RESOURCE-ALLOCATION-SETTING TABLE
110
RESOURCE ALLOCATION INFORMATION TABLE
111
131
121
PHYSICAL MACHINE
122
VIRTUAL MACHINE LPAR
RESOURCE UTILIZATION MEASUREMENT UNIT
123
CPU
124
MEMORY
125
126
HYPERVISOR
RESOURCE ALLOCATION UNIT
127

FIG. 2

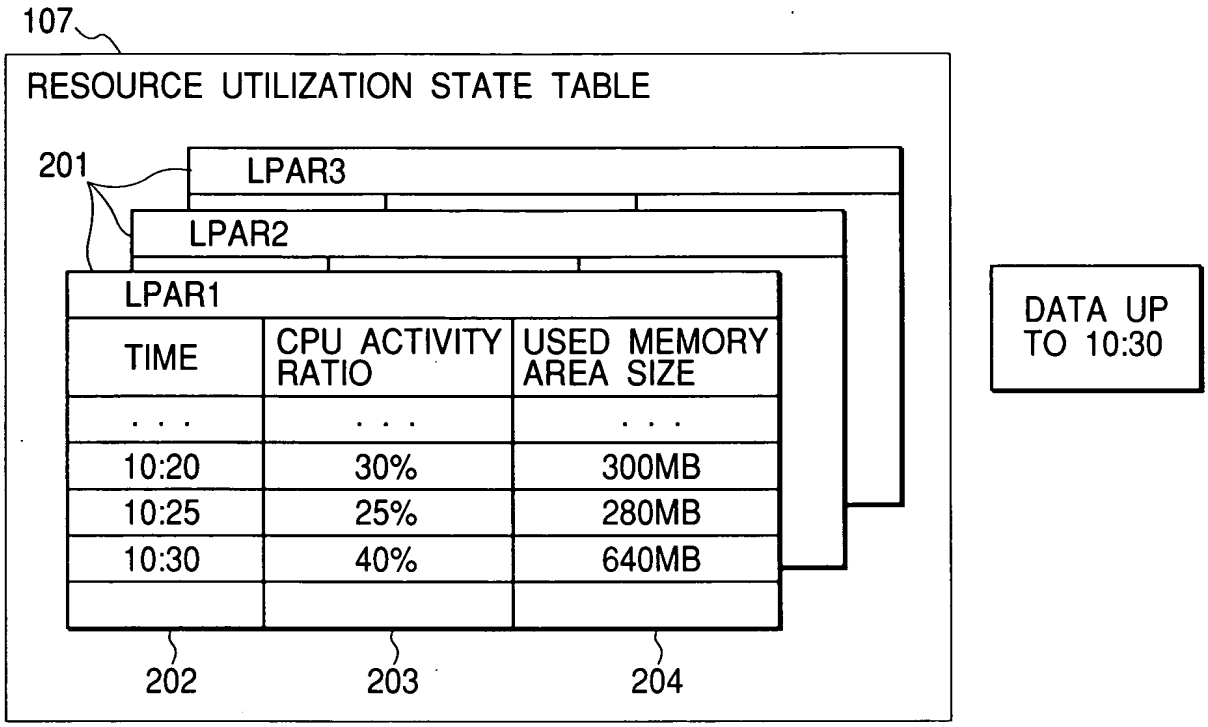


FIG. 3

CORRELATION COEFFICIENT TABLE 108

	LPAR1	LPAR2	LPAR3
LPAR1	1	0.1	0.7
LPAR2	0.1	1	0.3
LPAR3	0.7	0.3	1

301 302 303 304

FIG. 4

RESOURCE UTILIZATION FORECAST TABLE 109

	FORECASTED CPU ACTIVITY RATIO	FORECASTED USED MEMORY AREA SIZE
LPAR1	50%	1200MB
LPAR2	10%	60MB
LPAR3	20%	280MB

401 402 403

DATA FORECASTED AT 10:35

FIG. 5

RESOURCE-ALLOCATION-SETTING TABLE 110

	CPU ALLOCATION RATIO		ALLOCATED MEMORY AREA SIZE	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
LPAR1	70%	10%	1600MB	256MB
LPAR2	30%	10%	512MB	64MB
LPAR3	70%	10%	1500MB	128MB

501 502 503 504 505

FIG. 6

RESOURCE ALLOCATION INFORMATION TABLE
(BEFORE CHANGE)

111a

	CPU ALLOCATION RATIO	ALLOCATED MEMORY AREA SIZE
LPAR1	40%	1600MB
LPAR2	30%	512MB
LPAR3	30%	1500MB

601 602 603

ALLOCATIONS AT 10:30

THE RESOURCE ALLOCATION DETERMINATION UNIT CHANGE ALLOCATIONS

RESOURCE ALLOCATION INFORMATION TABLE
(AFTER CHANGE)

111b

	CPU ALLOCATION RATIO	ALLOCATED MEMORY AREA SIZE
LPAR1	50%	1200MB
LPAR2	21%	70MB
LPAR3	29%	330MB

601 602 603

NEW ALLOCATIONS

FIG. 7

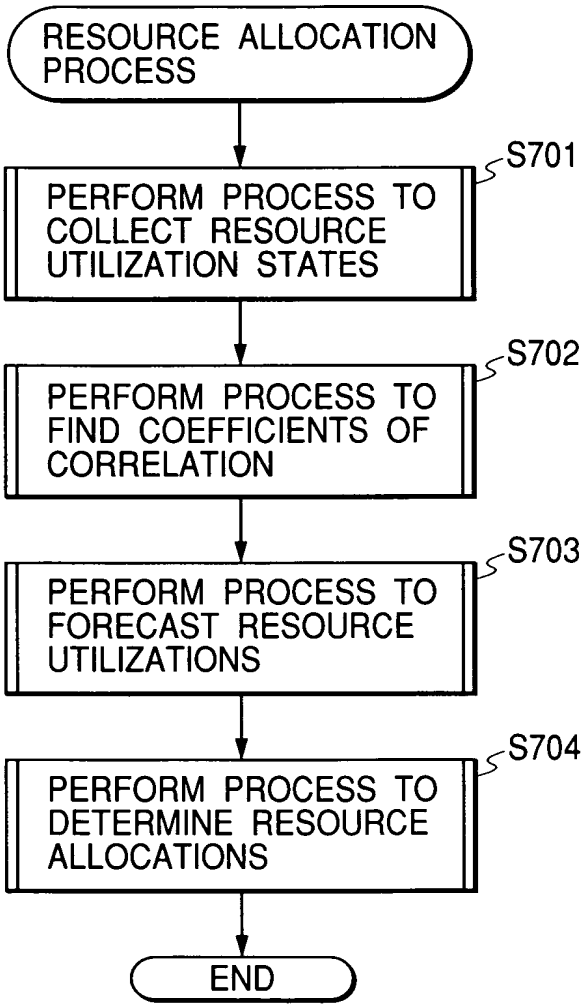

RESOURCE ALLOCATION PROCESS
S701
PERFORM PROCESS TO COLLECT RESOURCE UTILIZATION STATES
S702
PERFORM PROCESS TO FIND COEFFICIENTS OF CORRELATION
S703
PERFORM PROCESS TO FORECAST RESOURCE UTILIZATIONS
S704
PERFORM PROCESS TO DETERMINE RESOURCE ALLOCATIONS
END

FIG. 8

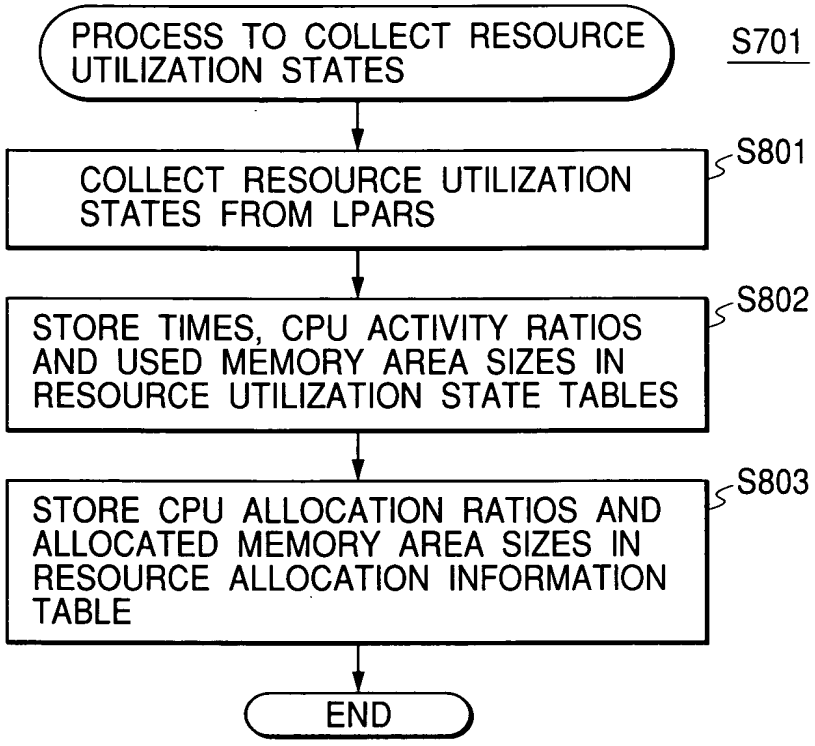

PROCESS TO COLLECT RESOURCE UTILIZATION STATES
S701
COLLECT RESOURCE UTILIZATION STATES FROM LPARS
S801
STORE TIMES, CPU ACTIVITY RATIOS AND USED MEMORY AREA SIZES IN RESOURCE UTILIZATION STATE TABLES
S802
STORE CPU ALLOCATION RATIOS AND ALLOCATED MEMORY AREA SIZES IN RESOURCE ALLOCATION INFORMATION TABLE
S803
END

FIG. 9

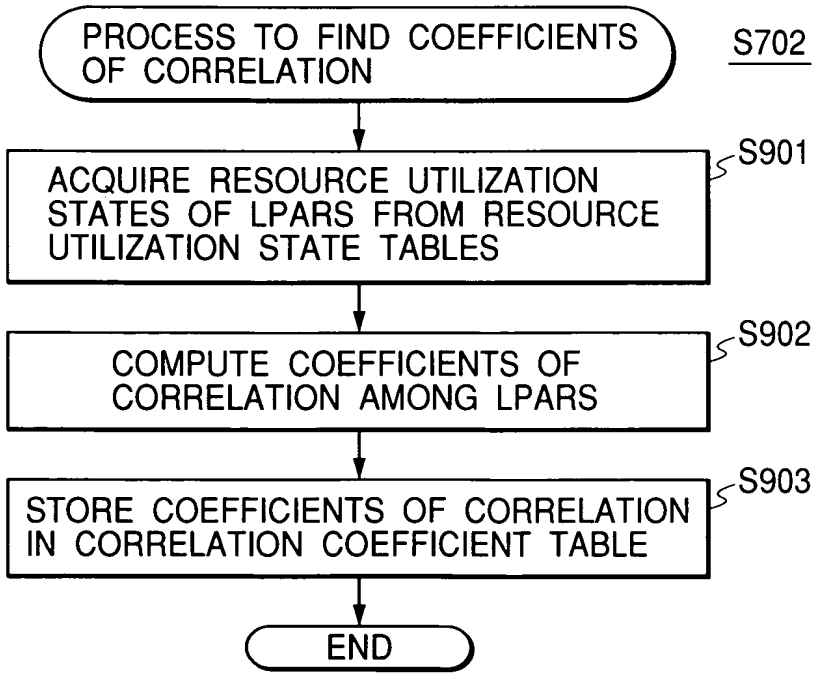

PROCESS TO FIND COEFFICIENTS OF CORRELATION
S702
ACQUIRE RESOURCE UTILIZATION STATES OF LPARS FROM RESOURCE UTILIZATION STATE TABLES
S901
COMPUTE COEFFICIENTS OF CORRELATION AMONG LPARS
S902
STORE COEFFICIENTS OF CORRELATION IN CORRELATION COEFFICIENT TABLE
S903
END

FIG. 10

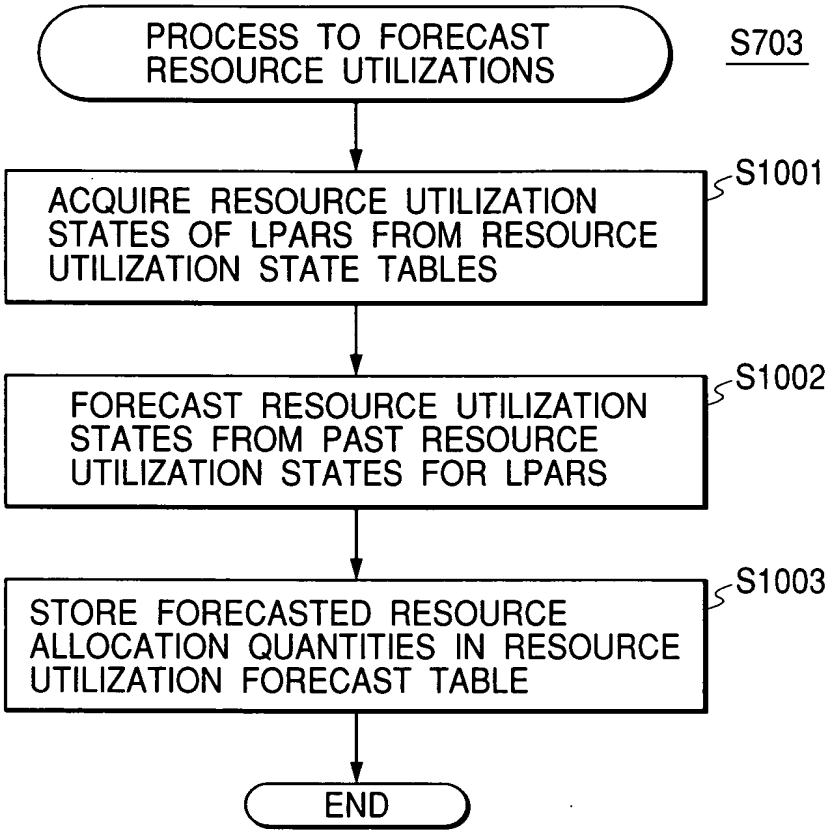

PROCESS TO FORECAST RESOURCE UTILIZATIONS
S703
ACQUIRE RESOURCE UTILIZATION STATES OF LPARS FROM RESOURCE UTILIZATION STATE TABLES
S1001
FORECAST RESOURCE UTILIZATION STATES FROM PAST RESOURCE UTILIZATION STATES FOR LPARS
S1002
STORE FORECASTED RESOURCE ALLOCATION QUANTITIES IN RESOURCE UTILIZATION FORECAST TABLE
S1003
END

FIG. 11

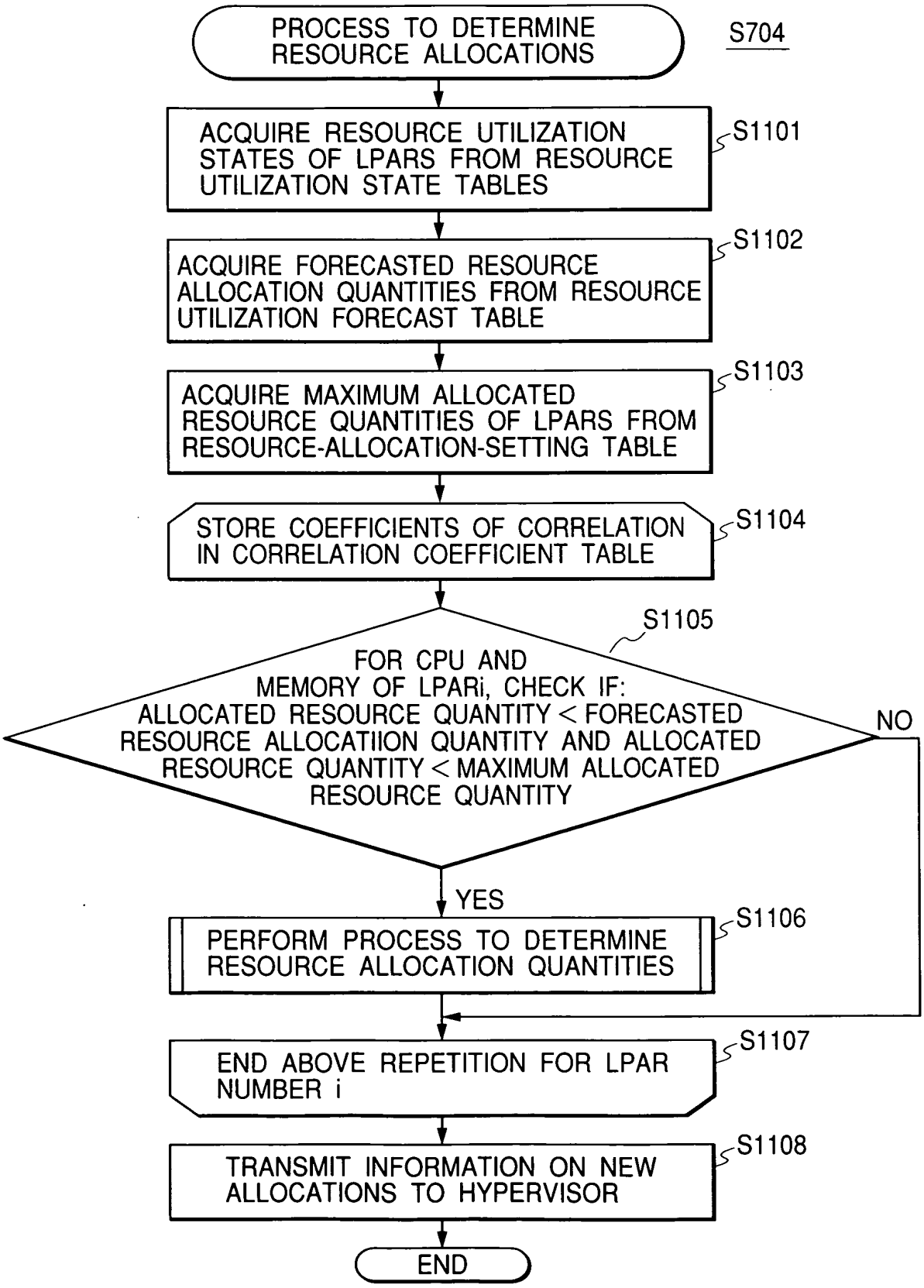

PROCESS TO DETERMINE RESOURCE ALLOCATIONS
S704
ACQUIRE RESOURCE UTILIZATION STATES OF LPARS FROM RESOURCE UTILIZATION STATE TABLES
S1101
ACQUIRE FORECASTED RESOURCE ALLOCATION QUANTITIES FROM RESOURCE UTILIZATION FORECAST TABLE
S1102
ACQUIRE MAXIMUM ALLOCATED RESOURCE QUANTITIES OF LPARS FROM RESOURCE-ALLOCATION-SETTING TABLE
S1103
STORE COEFFICIENTS OF CORRELATION IN CORRELATION COEFFICIENT TABLE
S1104
S1105
FOR CPU AND MEMORY OF LPARi, CHECK IF: ALLOCATED RESOURCE QUANTITY < FORECASTED RESOURCE ALLOCATIION QUANTITY AND ALLOCATED RESOURCE QUANTITY < MAXIMUM ALLOCATED RESOURCE QUANTITY
NO
YES
PERFORM PROCESS TO DETERMINE RESOURCE ALLOCATION QUANTITIES
S1106
END ABOVE REPETITION FOR LPAR NUMBER i
S1107
TRANSMIT INFORMATION ON NEW ALLOCATIONS TO HYPERVISOR
S1108
END

FIG. 12

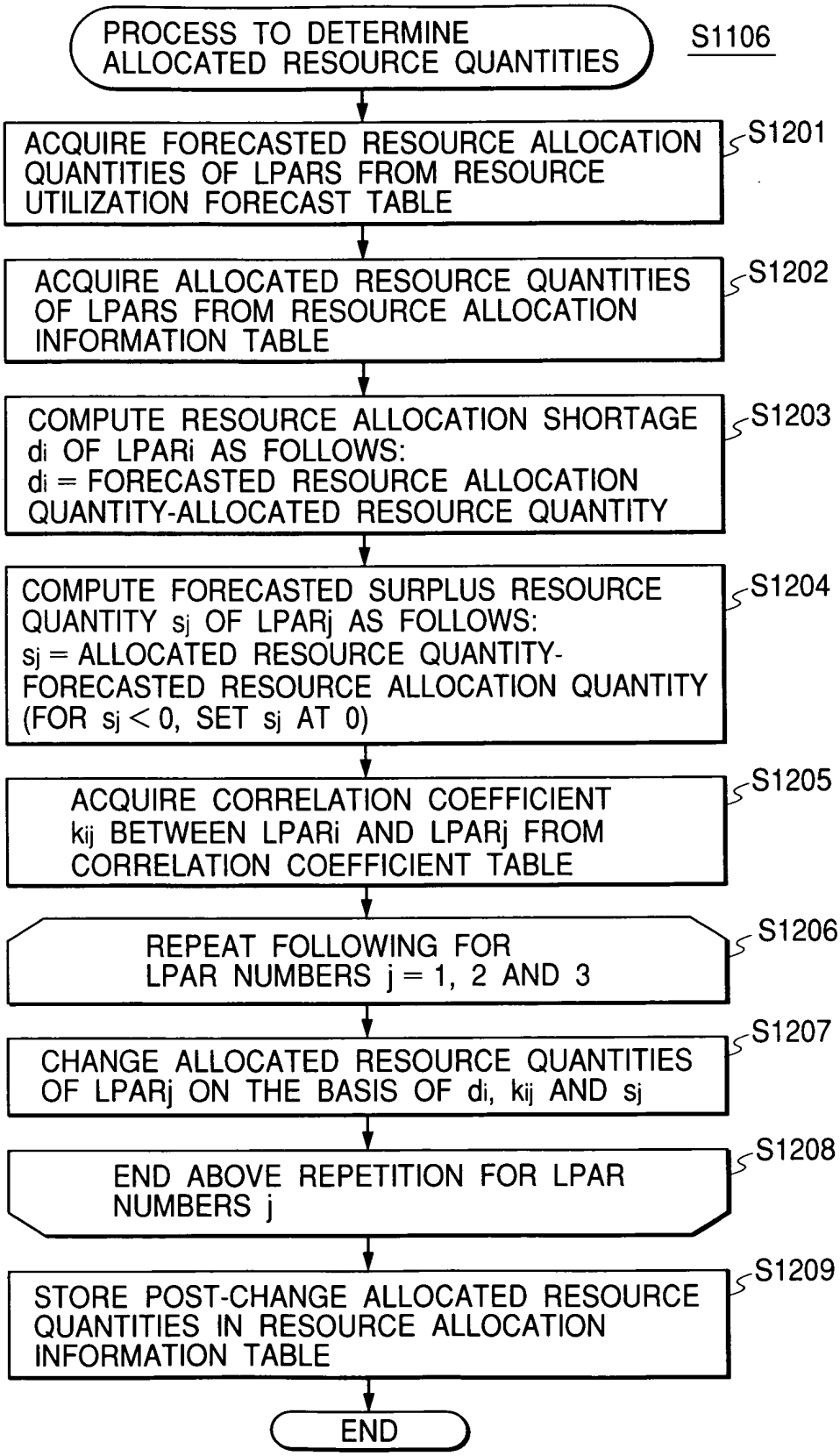

PROCESS TO DETERMINE ALLOCATED RESOURCE QUANTITIES
S1106
ACQUIRE FORECASTED RESOURCE ALLOCATION QUANTITIES OF LPARS FROM RESOURCE UTILIZATION FORECAST TABLE
S1201
ACQUIRE ALLOCATED RESOURCE QUANTITIES OF LPARS FROM RESOURCE ALLOCATION INFORMATION TABLE
S1202
COMPUTE RESOURCE ALLOCATION SHORTAGE di OF LPARi AS FOLLOWS:
di = FORECASTED RESOURCE ALLOCATION QUANTITY-ALLOCATED RESOURCE QUANTITY
S1203
COMPUTE FORECASTED SURPLUS RESOURCE QUANTITY sj OF LPARj AS FOLLOWS:
sj = ALLOCATED RESOURCE QUANTITY-FORECASTED RESOURCE ALLOCATION QUANTITY
(FOR sj < 0, SET sj AT 0)
S1204
ACQUIRE CORRELATION COEFFICIENT kij BETWEEN LPARi AND LPARj FROM CORRELATION COEFFICIENT TABLE
S1205
REPEAT FOLLOWING FOR LPAR NUMBERS j = 1, 2 AND 3
S1206
CHANGE ALLOCATED RESOURCE QUANTITIES OF LPARj ON THE BASIS OF di, kij AND sj
S1207
END ABOVE REPETITION FOR LPAR NUMBERS j
S1208
STORE POST-CHANGE ALLOCATED RESOURCE QUANTITIES IN RESOURCE ALLOCATION INFORMATION TABLE
S1209
END

FIG. 13

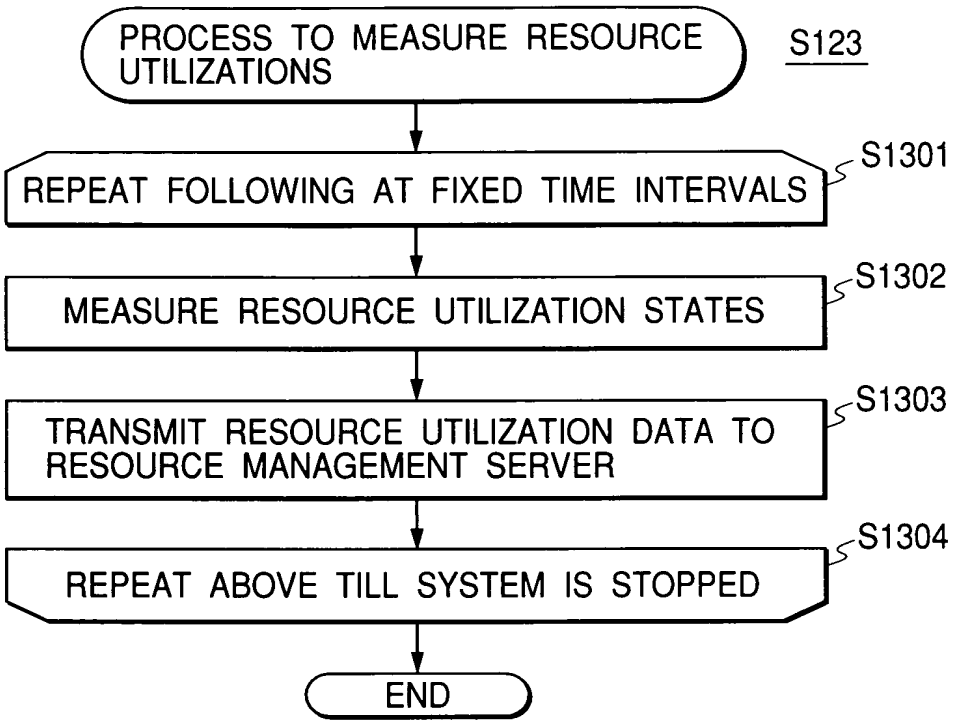
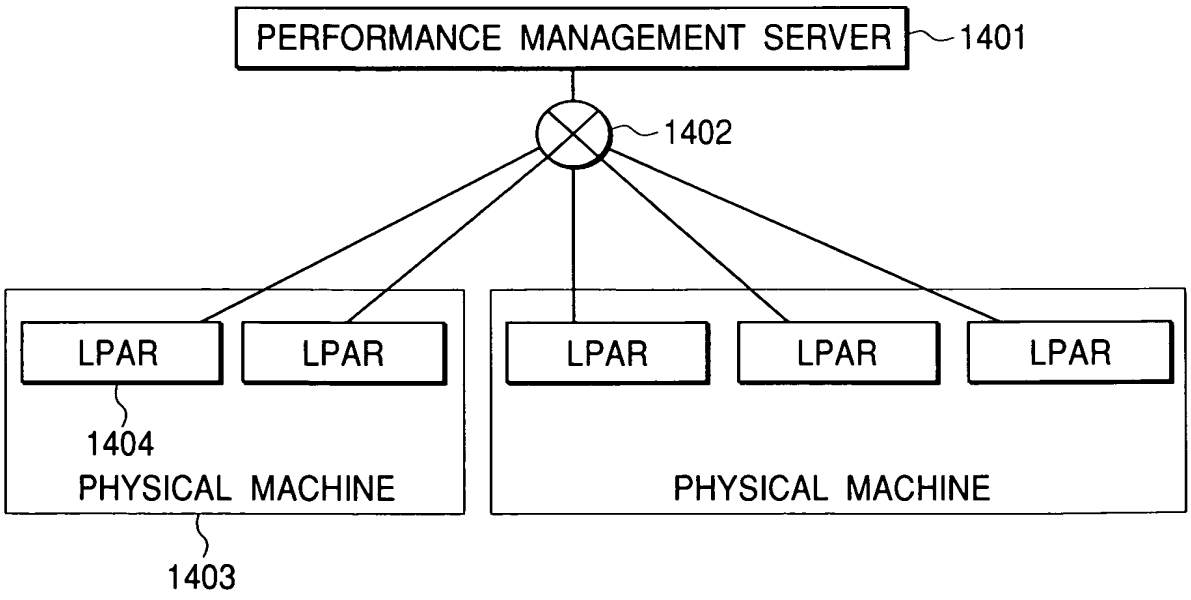

PROCESS TO MEASURE RESOURCE UTILIZATIONS
S123
REPEAT FOLLOWING AT FIXED TIME INTERVALS
S1301
MEASURE RESOURCE UTILIZATION STATES
S1302
TRANSMIT RESOURCE UTILIZATION DATA TO RESOURCE MANAGEMENT SERVER
S1303
REPEAT ABOVE TILL SYSTEM IS STOPPED
S1304
END

FIG. 14


PERFORMANCE MANAGEMENT SERVER
1401
1402
LPAR
LPAR
1404
PHYSICAL MACHINE
1403
LPAR
LPAR
LPAR
PHYSICAL MACHINE